EXAMPLE
CalEEMod Evaluation for a Hypothetical
SGC AHSC Affordable Housing Project

This is an example of how CalEEMod would be used for an Integrated Connectivity Project (ICP). This hypothetical example, "Rose Garden Residences", follows the steps detailed in Sections B & D of the Greenhouse Gas Quantification Methodology for the Strategic Growth Council Affordable Housing and Sustainable Communities Program Version 2 (AHSC QM V2).

Step 1: Define the Proposed Project

The following table provides sample data inputs for the Rose Garden Residences example project. This project data would be input into the CalEEMod "Project Characteristics" and "Land Use Screens."

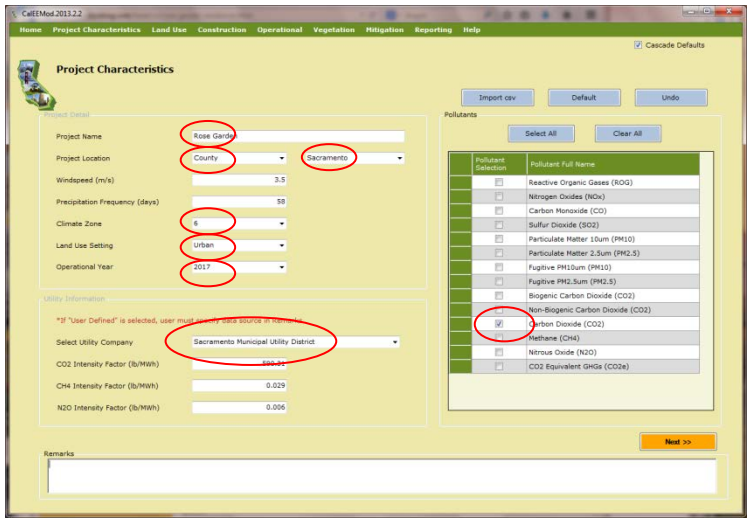
Table 1. Project Specific Data for Inputs

"Project Characteristics" Screen	Project Specific Data
Project Name	Rose Garden
County	Sacramento
Climate Zone[1]	6
Land Use Setting	Urban
Operational Year	Year 1 is 2017, Final Year is 2047
Utility Company	Sacramento Municipal Utility District
Pollutant	Carbon Dioxide (CO_2)
"Land Use" Screen	Project Specific Data
Land Use Type	Residential
Land Use Subtype	Apartment Mid Rise
Unit Amount	80 units
Size Metric	Dwelling Unit
Lot Acreage	2.5
Density	32 dwelling units/acre
Additional Project Information	Project Specific Data
Number of stories	Three (3)
Distance to Bus Transit	0.2 miles
Peak headways	30 minutes
Funds Requested	$3,200,000

[1] See CalEEMod Climate Zone lookup file at:
http://www.aqmd.gov/docs/default-source/caleemod/caleemod-appendixf.pdf?sfvrsn=2

CalEEMod "Project Characteristics" Screen

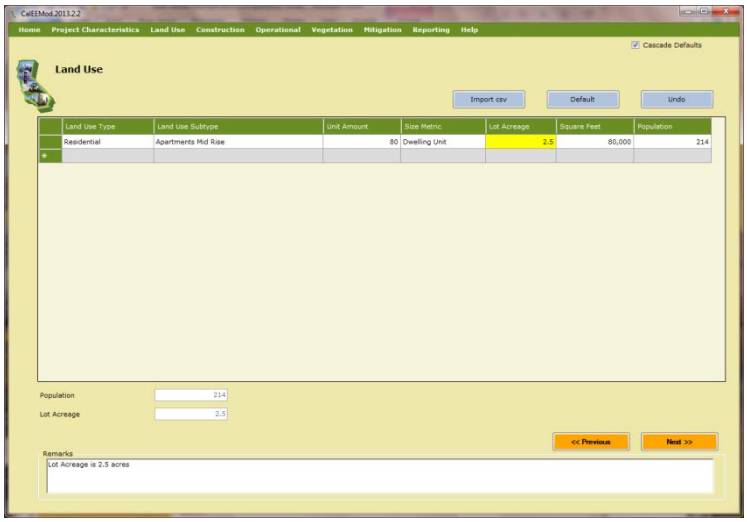
Using the example project specific data summarized in Table 1, fill in the required inputs in the "Project Characteristics" screen. Note that windspeed, precipitation frequency, and CO2, CH4 and N2O intensity factors will autofill.



CalEEMod "Land Use" Screen

For Land Use Type, enter "Residential." For the Land Use Subtype, enter multifamily mid rise (3 to 10 stories) as defined in the CalEEMod User's guide.[2] For acreage, override the default acreage by entering 2.5 acres. For square feet and population, use default values (because information was not available in Table 1).

Save your project using Home-Save As.



Step 2: Identify and Enter VMT Reduction Measures

This example project includes six traffic mitigation (i.e. VMT reduction) measures identified in Table 2. Note that for this project, only measures in the Traffic Mitigation "Land Use and Site Enhancement" screen are included. None of the VMT reduction measures listed in the "Commute" screen are included.[3] The project specific data for each reduction measure is shown in the second column. Instructions for each measure are listed in the third column in Table 2.

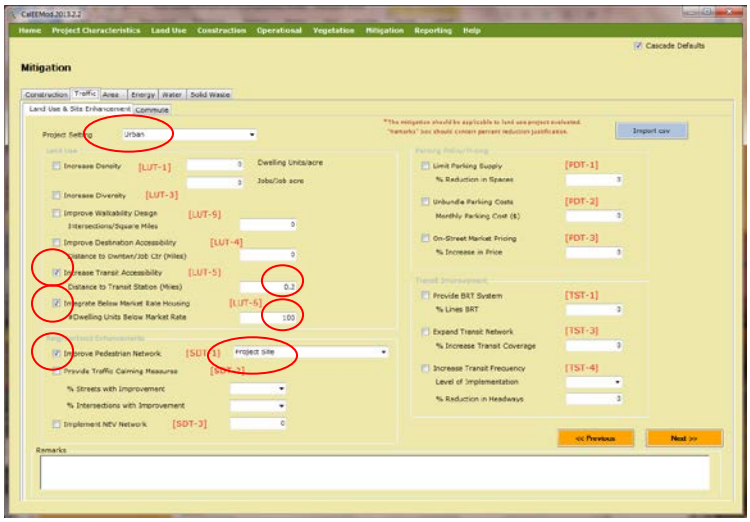
[2] CalEEMod Users Guide is available at http://www.aqmd.gov/docs/default-source/caleemod/usersguide.pdf?sfvrsn=2 (see page 16 for residential land use subtypes).

[3] The Commute measures are only applicable to land use types that have employees (e.g., retail and commercial).

Table 2. Summary of VMT Reducing Project Features

Project Mitigation Features	Project Data	AHSC QM V2 Instructions
Increase Density LUT-1	32 dwelling units/acre	Do not include in CalEEMod. Use calculations provided in Step 4 of the AHSC QM V2 instead.
Improve Destination Accessibility LUT-4	6 miles to Central Business District	Do not include in CalEEMod. Use calculations provided in Step 4 of the AHSC QM V2 instead.
Increase Transit Accessibility LUT-5	0.2 miles to closest bus stop with peak headway of 30 minutes	Include measure in CalEEMod and adjust reductions as described in Step 5 of the AHSC QM V2.
Integrate Below Market Rate Housing LUT-6	100% of units meet affordability requirements	Include in CalEEMod. Use percentage of instead of number of dwelling units Below Market Rate.
Improve Pedestrian Network SDT-1	Providing sidewalks on the project site	Include in CalEEMod by selecting "project site."

Check the boxes and included project specific data for "Increase Transit Accessibility", "Integrate Below Market Rate Housing" and "Improve Pedestrian Network", then navigate directly to the "Reporting" screen.



Step 3: Generate CalEEMod Report

Generate CalEEMod Annual Report for Initial Case and Project Case Yr1 (2017) using the "Reporting" screen, selecting "Annual" and clicking the "Recalculate Emissions and Run Report" box.

In Table 2.2, the "Unmitigated Operational Mobile" Total CO2 in MT/yr provides the initial case data for Yr1. In Table 2.2, the "Mitigated Operational Mobile" Total CO2 in MT/yr provides the final case data for Yr1.

2.2 Overall Operational

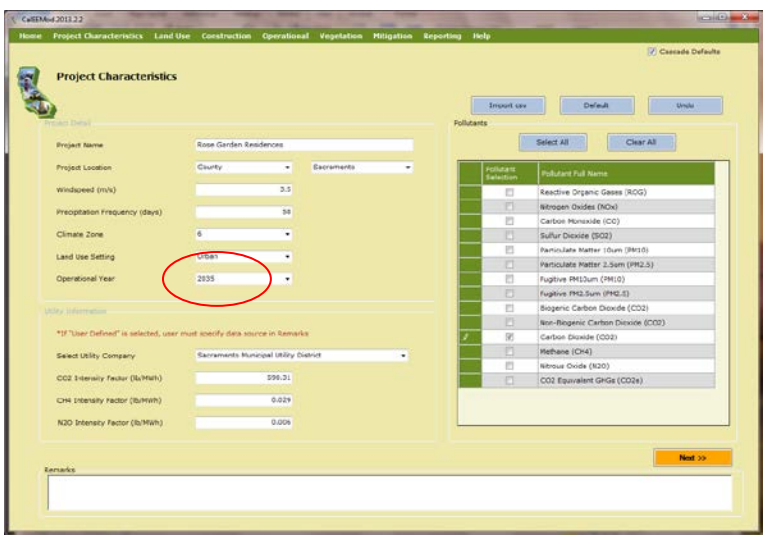
Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area													1.3476			
Energy													120.1037			
Mobile													549.2602			
Waste													7.4701			
Water													11.8776			
Total													**690.0593**			

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area													1.3476			
Energy													120.1037			
Mobile													432.6181			
Waste													7.4701			
Water													11.8776			
Total													**573.4172**			

To estimate the initial and project case for the final year (YrF is 2017+30=2047), there is no need to re-do Steps 1-2 for the final year. To generate a CalEEmod report for YrF: change the operational year YrF in Step 1 "Project Characteristics" Screen. Note that since the latest year available in CalEEMod is 2035, 2035 is used for YrF of 2035 or later. Generate a report for the final year to determine the initial case and project case for YrF by repeating Step 3.



For the example project, the data generated for the initial case and project case for Yr1 and YrF is summarized as follows:

Yr1 Initial case GHG emissions = 549.26 metric tons per year (MT/yr)
Yr1 Project Case GHG emissions = 432.62 MT/yr
YrF Initial Case GHG emissions = 458.29 MT/yr
YrF Project Case GHG emissions = 361.01 MT/yr

Step 4: Calculate Additional Benefits

The AHSC QM V2 provides calculations for additional benefits for "Increase Density", "Increase Destination Accessibility" and "Transit Subsidy for Residents." As listed in Table 2, the example project includes "Increase Density" and "Increase Destination Accessibility."

- This project includes "Increase Density", LUT-1 with a project density of 32 DU/acre.

  <u>Increase Density (LUT-1):</u>

  $$\%\ Density\ Increase = 100 * \frac{(32 - 7.6)}{7.6} = 321.05$$

  $$\%\ GHG\ Reduction = \%\ VMT\ Reduction = 0.07 * 321.05 = 22.47\% = 0.2247$$

  $$Yr1\ LUT1\ GHG\ Reduction = .2247 *\ 549.26 = 123.42\ \mathrm{MT/yr}$$

  $$YrF\ LUT1\ GHG\ Reduction = .2247 *\ 458.29 = 102.98\ \mathrm{MT/yr}$$

- This project includes "Increase Destination Accessibility" LUT-4 with a distance to the central business district of 6 miles.

  <u>Increase Destination Accessibility (LUT-4):</u>

  $$\%\ \mathrm{Distance\ Decrease} = 100 * \frac{(6 - 12)}{12} = -50\%\ =\ -0.5$$

  $$\%\ \mathrm{GHG\ Reduction} = \%\ \mathrm{VMT\ Reduction} = (-0.20) * (-0.5) = 0.10$$

  $$\mathrm{Yr1\ LUT4\ GHG\ Reduction} = .10 *\ 549.26 = 54.93\ \mathrm{MT/yr}$$

  $$\mathrm{YrF\ LUT4\ GHG\ Reduction} = .10 *\ 458.29 = 45.83\ \mathrm{MT/yr}$$

- This project does not include TRT-4 Annual transit subsidy/discount for housing residents.

Step 5: ICP Adjustment

The data supporting transit accessibility (LUT-5) in CalEEMod are based on high-quality transit service. Since ICP projects include non-high-quality transit, an adjustment is needed as described the AHSC QM V2. This step applies to the example ICP project since it includes credit for LUT-5 in CalEEMod and has transit peak headways with frequencies less than 75 minutes.

$$\mathrm{Yr1\ ICP\ GHG\ Reduction} = 0.025 *\ 549.26 = 13.73\ \mathrm{MT/yr}$$

$$\text{YrF ICP GHG Reduction} = 0.025 * 458.29 = 11.46 \text{ MT/yr}$$

Step 6: Calculate the CalEEMod GHG Reductions Over the Project Life

Calculate and adjust the project case GHG emissions using the values from CalEEMod Step 3 reports and the additional benefits and adjustments in Steps 4 and 5**.** "*Project Life GHG Reductions*" must be calculated for Yr1 and YrF using the following equations:

$$\begin{aligned} &Adj\ Project\ Case\ GHG\ Emissions\ (calculate\ for\ Yr1\ and\ YrF) \\ &\quad = Project\ Case\ GHG\ Emissions\ (Step\ 3) \\ &\quad -LUT1\ GHG\ Reductions\ (Step\ 4) \\ &\quad -LUT4\ GHG\ Reductions\ (Step\ 4) \\ &\quad +ICP\ GHG\ Adustment\ (Step\ 5) \end{aligned}$$

$$\begin{aligned} &Yr1\ Adj\ Project\ Case\ GHG\ Emissions \\ &\quad = 432.62 - 123.42 - 54.93 + 13.73 = 268 \text{ MT/yr} \end{aligned}$$

$$\begin{aligned} &YrF\ Adj\ Project\ Case\ GHG\ Emissions \\ &\quad = 361.01 - 102.98 - 45.83 + 11.46 = 223.66 \text{ MT/yr} \end{aligned}$$

Total GHG reductions are calculated by subtracting the adjusted project case GHG emissions from the initial case GHG emissions for Yr1 and YrF.

$$Total\ GHG\ Reductions\ Yr1 = 549.26 - 268 = 281.26 \text{ MT/yr}$$

$$Total\ GHG\ Reductions\ YrF = 458.29 - 223.66 = 234.63 \text{ MT/yr}$$

The GHG emission reductions over the 30 year life of the project are:

$$Project\ Life\ GHG\ Reductions$$

$$= \left(\frac{281.26 + 234.63}{2}\right) * 30$$

$$= 7738.35\ MT\ CO2\ over\ project\ life$$

Section D: Reporting and Documentation

The project example includes reductions from Section B (CalEEMod) and does not include reductions from Section C (Transit and Connectivity Methods). Use the CalEEMod results from Step 6 as follows:

Total Project GHG Emission Reductions in MTCO2 (from CalEEMod Section B)

$$= 7738.35\ MT\ CO2\ over\ project\ life$$

Report the results as follows using the requested funding listed in Table 2:

$$= \frac{7738.35\ MT\ CO2\ over\ project\ life}{3{,}200{,}000\ GGRF\ funds\ requested\ (\$)}$$

$$= \frac{0.00242\ MT\ CO2\ over\ project\ life}{GGRF\ funds\ requested\ (\$)}$$